Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_

Exercise and Cellular Respiration

**Question**: How does physical activity affect the circulatory (heart rate) and respiratory (breathing rate) systems?

**Hypothesis**: Develop a hypothesis about how physical activity (exercise) affects pulse (heart) and breathing rates.

If physical activiy increases then...\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

because…\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Procedure 1**: **Measuring resting pulse (heart) rate**

1. Find your pulse by placing our second and third fingers on the top of your neck (common carotid artery) or on the side of your inner wrist that is closest to the thumb (the radial artery).
2. Press down slightly and count your pulse (the number of beats you feel) for 30 seconds. RECORD your results in Data Table 1. Repeat this step two more times.
3. Calculate the average number of beats for the three trials and record this value in Data Table 1.
4. Multiply the average number of beats by two to get the average pulse/heart rate in beats per minute.

**Data Table 1: Resting Pulse Rate**

|  |  |  |  |
| --- | --- | --- | --- |
| My Resting Pulse (Heart) Rate | | My Partner’s Resting Pulse (Heart) Rate | |
| Trial | Beats in 30 sec | Trial | Beats in 30 sec |
| 1 |  | 1 |  |
| 2 |  | 2 |  |
| 3 |  | 3 |  |
| Average # of beats |  | Average # of beats |  |
| Pulse rate (beats/min) |  | Pulse rate (beats/min) |  |

**Procedure 2: Measuring breathing rate at rest**

1. Have your partner count the number of times you inhale (breathe in) in 30 sec. You and your partner will probably have to observe closely. RECORD in the Data Table 2. Repeat this step two more times.
2. Calculate the average number of breaths and record this value in Data Table 2
3. Multiply the average number of breaths by two to get the average resting breathing rate in breaths per minute.

**Data Table 2: Breathing Rate at Rest**

|  |  |  |  |
| --- | --- | --- | --- |
| My Resting Breathing Rate | | My Partner’s Resting Breathing Rate | |
| Trial | Inhalations in 30 sec | Trial | Inhalations in 30 sec |
| 1 |  | 1 |  |
| 2 |  | 2 |  |
| 3 |  | 3 |  |
| Average # of breaths |  | Average # of breaths |  |
| Breathing rate (inhalations/min) |  | Breathing rate (inhalations/min) |  |

**Procedure 3: Measuring the effect of exercise on respiratory and circulatory systems**

1. Exercise for 1 minute. You can do jumping jacks, run in place or do push-ups.
2. Immediately after you stop exercising, look at the time/start and timer and measure your pulse beats for30 seconds. During the SAME time, your partner should measure the number of inhalations you make. Record in Data Table 3.
3. Repeat steps 1 and 2 (These will count as trials 2 and 3.). Be sure to record your data!
4. Calculate the average number of beats and inhalations
5. Calculate the pulse and breathing rates by multiplying the average by two.

**Data Table 3: Pulse and Breathing Rates after Exercise**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| My data | | | My partner’s data | | |
| Trial | Beats in 30 sec | Inhalations in 30 sec | Trial | Beats in 30 sec | Inhalations in 30 sec |
| 1 |  |  | 1 |  |  |
| 2 |  |  | 2 |  |  |
| 3 |  |  | 3 |  |  |
| Average |  |  | Average |  |  |
| Rate (beats or inhalations per min) |  |  | Rate (beats or inhalations per min) |  |  |

**Graph your and your partner’s resting and exercise pulse rates and breathing rates.**

**Pulse Rates before and after Exercise Breathing Rates before and after Exercise**

|  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |
| My before exercise |  |  |  | Partner’s after exercise |  |  |

Pulse Rate (beats/min)

Partner’s before exercise

My after exercise

Physical State

**Analysis**

|  |  |  |
| --- | --- | --- |
|  | **Describe how the rate changed after exercise: Increased? Remained the same? Decrease?** | **Give the amount of the change** (+ if was an increase, - if was a decrease) |
| **Your Pulse Rate** |  |  |
| **Partner’s Pulse Rate** |  |  |
| **Your Breathing Rate** |  |  |
| **Partner’s Breathing Rate** |  |  |

**Conclusion**

* Did the data support or not support your hypothesis? **EXPLAIN using data for evidence.** ‘

The data did / did not (circle one) support my hypothesis that if physical activity increases then…[restate your hypothesis] \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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The data showed that as physical activity increases…..\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Is there a connection between the pulse and breathing rates? Do they both increase or decrease together? Give evidence for your answer.

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CONNECTION TO CELLULAR RESPIRATION

With each heartbeat, blood is sent throughout our bodies, carrying oxygen and nutrients to every cell. Every day, the approximately 10 pints (5 liters) of blood in your body travel many times through about 60,000 miles (96,560 kilometers) of blood vessels that branch and cross, linking the cells of our organs and body parts.

The circulatory system is composed of the heart and blood vessels, including arteries, veins, and capillaries. Our bodies actually have two circulatory systems: The pulmonary circulation is a short loop from the heart to the lungs and back again, and the systemic circulation (the system we usually think of as our circulatory system) sends blood from the heart to all the other parts of our bodies and back again.

The heart is the key organ in the circulatory system. As a hollow, muscular pump, its main function is to propel blood throughout the body. It usually beats from 60 to 100 times per minute, but can go much faster when necessary. It beats about 100,000 times a day, more than 30 million times per year, and about 2.5 billion times in a 70-year lifetime.

The heart gets messages from the body that tell it when to pump more or less blood depending on an individual's needs. When we're sleeping, it pumps just enough to provide for the lower amounts of oxygen needed by our bodies at rest. When we're exercising or frightened, the heart pumps faster to increase the delivery of oxygen.

The circulatory system works closely with other systems in our bodies. It supplies oxygen and nutrients to our bodies by working with the respiratory system. At the same time, the circulatory system helps carry waste and carbon dioxide out of the body.

Source: KidsHealth.org

1. Why does your heart beat?
2. What does blood carry to our cells?
3. Why do we need less oxygen when we’re asleep?
4. Under what conditions do we need more oxygen?
5. For what process do cells (plant and animal) need oxygen?
6. What does the above process create?